Bureau of Standards
JAN 10 1922

HGB:AER

7

99169
Com.
144

DEPARTMENT OF COMMERCE

BUREAU OF STANDARDS

WASHINGTON

R151

Technical News Bulletin No. 57

January 9, 1922.

GENERAL NOTE

Owing to the current nature of the investigations mentioned in the Technical News Bulletin, sometimes it will be impossible to supply printed information regarding them. However, in these cases, when the investigation has progressed sufficiently far, the Bureau will be pleased to furnish technical data to those engaged in the particular application of the subject, in order to avoid the delay incident to publication.

---

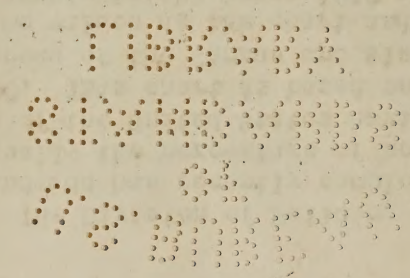
1 Percentage of Home Ownership in Cities of the United States

The Division of Building and Housing of the Bureau of Standards has recently completed a chart showing graphically the percentage of home ownership in 1920 in cities of the United States having a population of over 100,000. This chart is based on statistics compiled by the Bureau of the Census and also includes a table giving the same values as the chart and in addition the percentage of ownership in the years 1910 and 1900.

In 1920, the lowest percentage of ownership in the country was in New York City, having 1,278,341 homes of which 12.7% were owned by the occupa[illegible] At the other end of the list is Des Moines, Iowa, wit[illegible]644 homes of which 51.1% are owned.

2 Building Material Prices

A mimeographed table giving prices on building materials as of December 1, 1921, has just been issued by the Bureau. This shows the prices in 35 cities of such commodities as brick, Portland Cement, various kinds of lumber, lime, sand, stone, glass of all sorts, pipe, paint, varnish, and roofing materials.



3 Concrete Housing

A member of the Bureau's staff recently made a trip of inspection covering various concrete housing projects. This is the third trip of the kind that has been carried out and covered the territory in the neighborhood of Pittsburgh, Cleveland, Chicago, and Minneapolis. Three days were spent in the vicinity of Pittsburgh inspecting various types of concrete houses both those built according to monolithic and concrete block construction, including 2 important projects at Johnstown, Pa., and Donora, Pa. The former includes 89 concrete houses built by the Cambria Steel Company in 1920 and 1921, while the latter consists of concrete houses of the Lambie type built in 1917 and 1918.

The most notable development in the vicinity of Chicago is the institution at Mooseheart, Ill., built by the members of the Loyal Order of Moose for the education of the fatherless children of the Order. The use of concrete has developed to a remarkable degree not only in the construction of the Mooseheart buildings but also in the production of ornamental and architectural concrete.

Inspection of the Morgan Park houses, a development of the Minnesota Steel Company, at Duluth, occupied 2 days. The project includes about 500 houses most of them being constructed of small concrete units. Other projects included the houses built by the Hydraulic Steel Company at Cleveland, while at Canton the metal, lumber, and stucco houses developed by the Berger Manufacturing Company were studied. It is believed that the last-named type will undoubtedly become more or less common in the future. There is a greater diversity of concrete house types in the vicinity of Youngstown than at any other point, since there may be found the Donaldson and Lambie houses built by the General Fireproofing Company together with a steel and stucco house of their own design.

Nearby is the well-known project of 281 concrete houses built by the Youngstown Sheet and Tube Company in 1917. The Carnegie Steel Company has a housing project located at McDonald in which there are 72 of the Van Guilder type of concrete houses and a very extensive use of concrete in city pavements, sidewalks, and sewers. The same company has a project of 50 Van Guilder houses at Steelton.

4 Specifications for China Tableware

Tests on the ware at the Bureau have been completed and the results presented before the U. S. Potters' Association. A great deal of interest was created, and many offers of additional ware for testing were received. The Potters' Association has appointed a research committee which will cooperate with the Bureau in devising standard specifications.

5 Specifications for Glass Tableware

All government departments have now accepted the Tumbler Specifications prepared by the Bureau, and a request has been made for printing these so that they will be available for departmental use. An article is also being prepared describing the work which led to the adoption of the tests specified, which will be offered for publication in technical journals.

6 Specifications for Window and Plate Glass

A large amount of figured and wire plate glass has been tested, the results showing great uniformity of the product, the strength increasing as the square of the thickness, as is the case with many other materials. Sufficient glass of each type is being tested to give an accurate and unquestionable average of strength for this kind of material. Sufficient information has been gathered to warrant the calling of a conference of the Subcommittee on Definitions and Nomenclature during the present month.

7 Meeting of Advisory Committee on Refractories

The meeting of the Committee on Refractories of the Federal Specifications Board, held at the Bureau of Standards on December 19, was attended by all the departments most concerned with the purchase of this class of material. The policy of using so far as possible, standard shapes of the Refractories Manufacturers' Association was recommended. After a long discussion on the question of specifications, it was voted to ask the Bureau of Standards to prepare a set of specifications which the representatives of the advisory board could submit to their respective departments for criticism. The vote on this motion would have been unanimous, but for one member who had come to the conference instructed to the contrary.

8 Specifications for Enameled Kitchen Ware

Practically all the samples of ware for test have been received, and the tests are rapidly being completed. Results will be mailed to the interested parties early this month. In order to take up some of the tests on larger articles, arrangements have been made with Sears, Roebuck and Company for obtaining various sizes of enameled pans to be included in the work. A representative of the enameled metal section addressed members of the Sheet Metal Ware Association at New York concerning the object and scope of this work.

9 Standardization of Cordage

A conference was held recently with representatives of the Bureau of Foreign & Domestic Commerce and with the representative of the Cordage Institute, Mr. J.S. McDaniel. At the meeting, Mr. McDaniel stated that his organization represents 80% of the hard fiber cordage manufacturers, and that at their last meeting they voted to give the Bureau cooperation in every possible way in this work.

The work on nomenclature will be taken up first and later the standardization of the cordage itself. The Bureau plans to hold another conference with the entire organization of cordage manufacturers in February.

10 Thermal Stresses in Steel Car Wheels

On December 10, a conference was held at the Bureau to discuss the accumulated data obtained in thermal tests of steel car wheels. Representatives of various manufacturers and purchasers of steel wheels were present. The results obtained in the tests of 16 wheels completed to date were discussed, the interesting features of which may be summarized as follows:

(1) None of the steel wheels failed.

(2) Because of the movement of the hub with respect to the rim, on account of the heating of the rim, a beam effect is produced in the plate which induces tensional stresses near the hub and stresses in compression near the rim on the face of the plate, while on the back of the plate the stresses are approximately equal in magnitude but reverse in nature.

(3) These effects were observed in new wheels, while in the case of old wheels the stresses on the face of the plate were in tension near the hub and at the rim they decrease to practically nothing, this difference from the new wheel probably being due to the quantity of metal worn away.

(4) The magnitude of the maximum stresses developed approximated the yield point of the material as determined in tensile tests.

(5) After the first "run" on the new wheels, an apparent set was obtained which was not the case in succeeding "runs" nor in "runs" on old wheels. The maximum stresses were in the surface of the plates and beyond the yield point of the material.

It was suggested by one representative that tests on wheels with thinner plates be made in order to determine the effect of plate thickness on induced stresses. One of the steel companies expressed a willingness to furnish wheels for this test, and the matter is now being considered.

Further work on single plate chilled iron wheels seems justified in view of the fact that a survey of the stresses on the back of the plate of this type of wheel was not made. From experience with the steel wheels, it is believed that the stresses will be quite different from those on the face.

11 Corrosion of Steels

Laboratory work relating to the determination of the relative resistance of certain alloy steels to corrosion when submitted to combined weathering and immersion in distilled water was completed during the

month. Based on exposure of 19 days, the polished samples of steel showed the best resistance to corrosion in the order given below:

(1) Annealed stainless steel (C 0.15%, Cr 13%);
(2) Annealed high chromium and high nickel steels;
(3) Forged stainless steel;
(4) Cast iron chromium alloy (C 0.04%, Cr 6.5%);
(5) Annealed chromium steel (C .20%, Cr 8.6%);
(6) Annealed chromium steel (C .30%, Cr 5.72%);
(7) Annealed chromium steel (C .28%, Cr 3.90%);
(8) Pure iron;
(9) Iron carbon alloy (C 0.45%).

12 Cutting Tests of High Speed Tool Steel Bits

A number of tool bits of standard high speed tool steel were heat treated in various ways to determine the effect of these treatments on the cutting qualities of the metal. About 55 cutting tests were made, and while no new facts were brought to light, the data obtained were interesting and show that it is possible to obtain valuable results from tests made with such small samples. This work is being continued, and an effort will be made to study the time temperature relations in preheating and hardening on the cutting qualities of high speed tool steels.

13 Recent Publication on Spectroscopy

Scientific Paper No. 421 of the Bureau of Standards was issued last month and is entitled "Wave Lengths Longer than 5500 A in the Arc Spectra of Yttrium, Lanthanium, and Cerium, and the Preparation of Pure Rare Earth Elements." The second portion of this paper was contributed by the Chemistry Department of the University of Illinois, which is cooperating with this Bureau in the standardization of rare earth elements.

The manuscript of another paper dealing with wave length measurements in the arc spectra of neodymium and samarium has been prepared. A large number of lines were found to be common to both these materials and may belong to the unknown element which is supposed to lie between Nd and Sm in the periodic table.

14 Revision of Specifications for Incandescent Lamps

During the month, conferences were held with representatives of the General Supply Committee and several lamp companies in connection with the revision of specifications and proposals for supplying lamps under government contract for the next fiscal year. In general, a consistent effort is being made to eliminate from the schedules all special lamps.

The lamps formerly classified under the 110 and 125 volt range have all been grouped in four voltages, namely, 110, 115, 120, and 125, and similarly lamps of the 220 volt range have been grouped into 10 voltage steps.

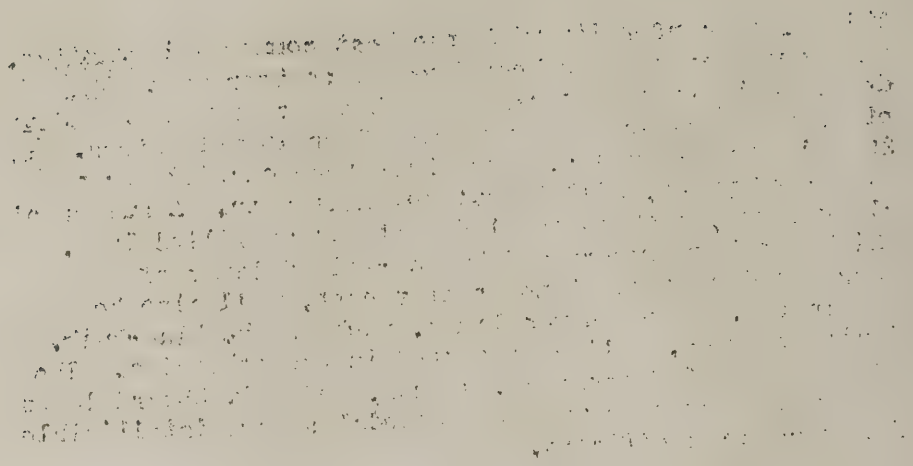
This is in conformity with the best commercial practice, and some pressure has been brought to bear upon other departments to change circuits which are now operated at other voltages so as to use even 5 or 10 volt steps. The 20 and 60 volt groups, which have been carried for a number of years, will be cut out next year. A number of older sizes, such as the 100 watt vacuum filled lamp, which has been superseded by gas-filled lamps of corresponding size at no greater cost, will also be eliminated. Some newer lamps, such as the blue-bulb, daylight types, will be inserted in the schedules. The arrangement of decorative, signal, and switchboard lamps has been changed to make the schedules more intelligible for purchasing officers.

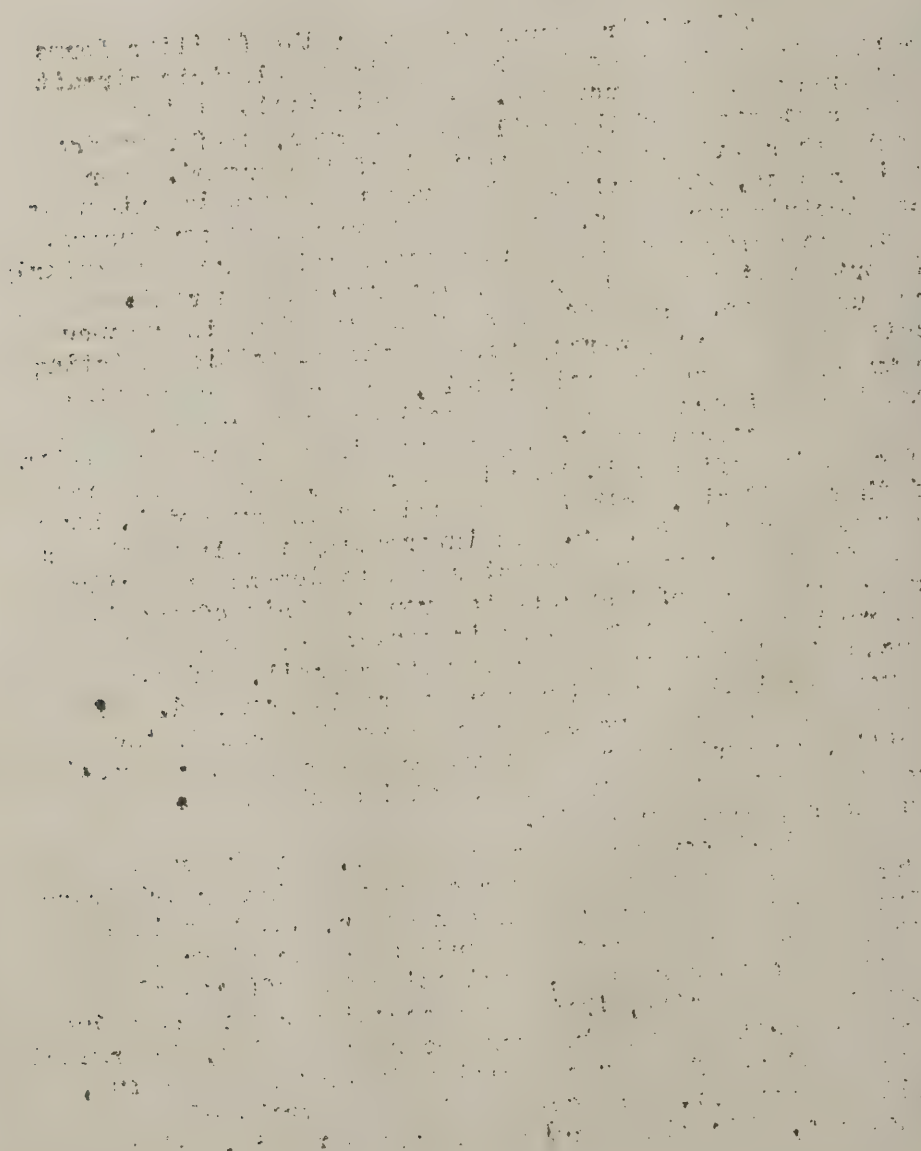
15 Capacity Effects in Inductance Coils

A coil of wire wound in any of the familiar forms called "inductance coils" behaves in an electric circuit primarily as an inductance. The potentials of the different parts of the coil are, however, different from each other and from the potential of the ground. For this reason, the coil also behaves to a certain extent as an electric condenser, or rather a system of condensers. These capacity effects of inductance coils are particularly important at the high frequencies employed in radio communication. The effective capacity of an inductance coil depends, in general, both on the capacities existing between parts of the coil itself, and on the capacities existing between parts of the coil and the ground.

On account of the importance in radio communication of capacity effects in inductance coils, careful studies of these effects, both theoretical and experimental, have been made at the Bureau. An interesting result which has been found is that one effect seems to depend primarily on the capacity of the coil to ground. This effect is observed when two condensers in series are connected across the terminals of the inductance coil, and the common terminal of the two condensers is grounded. If the inductance coil possesses capacity to ground, the familiar criterion for resonance in the system, computed from the known value of the capacities of the two condensers, will not apply.

If both condensers are variable, and the system is adjusted for resonance by successively assigning arbitrary values for the setting of one condenser, and then tuning with the other condenser, it would be expected from elementary considerations, neglecting the effects of distributed capacity, that the successive resonance values of the capacity of the two condensers in series, determined as the product of their capacities divided by their sum, would be constant. On account of the distributed capacities, this simple relation does not hold. It is





found, however, that under the conditions above mentioned, with the common terminal grounded, the capacity of the two condensers in series determined as the product of their capacities divided by their sum, is linearly related to the reciprocal of the sum of their capacities. This relation has been verified both mathematically and experimentally.

The results of both the mathematical and experimental investigation of this particular phase of the problem of capacity effects in inductance coils are given in a publication of the Bureau which has just appeared, Scientific Paper No. 427, "Some Effects of the Distributed Capacity Between Inductance Coils and the Ground," Copies may be purchased from the Superintendent of Documents at 5¢ a copy.

16 Standardization of Dry Cells

An important meeting was held at the Bureau on December 5 and 6 at which the standardization of sizes and specifications for dry cells was considered. Manufacturers of about 95% of the flashlight batteries and dry cells, as well as many of the Government departments and other users, were represented at the meeting.

This conference has grown out of some important work carried out by the Bureau in 1918. When the war was in progress, it was important to eliminate so far as possible unnecessary sizes of articles and also to buy them according to standard specifications. This was particularly true in the case of batteries of which large numbers were required by the Army and Navy.

In cooperation with the War Industries Board, the Bureau of Standards prepared a list of standard sizes and specifications governing many types of dry cells. After the war, when the restrictions imposed by the War Industries Board were removed, many of the manufacturers felt it necessary to again take up the production of a large number of sizes of cells many of which are not in very general use.

The conference considered 17 sizes of dry cells and standardized 7 of these sizes. It considered 30 different sizes and kinds of flashlight batteries and adopted 8 of these as standard sizes. Two sizes for use with radio apparatus were standardized. It is expected that the elimination of many sizes for which there is little demand and which will no longer be considered as standard will result in considerable saving in the cost of manufacture and increase the convenience of the public who buy these batteries to the extent of approximately 150,000,000 per year. In addition to the standardization of sizes, the conference standardized the performance for the sizes which were accepted.

The Bureau was requested to make a revision of its specifications for dry cells in conformity with the standards as adopted by the conference. The Bureau is pleased to acknowledge the hearty cooperation which was received from the manufacturers in this work.

17 Application of Radio Telephony in the Life Saving Service

The Bureau has been cooperating with the U. S. Coast Guard Service in the development of a radio telephone apparatus to maintain communication between a motor lifeboat and the shore station. The great importance of maintaining reliable communication between the shore and a boat engaged in rendering assistance to a wrecked ship is obvious. As most of such rescue work necessarily has to be performed in stormy weather, it is highly desirable to reduce to a minimum any apparatus above the deck level of the boat. No loose wires above, in, or under the boat are permissible, since these would interfere with the proper handling of the boat and the throwing of lines. For this reason, the installation of a small antenna of the ordinary elevated type, even a short distance above the deck, would be very undesirable.

After considerable investigation, it was decided that a coil antenna offered the best prospects for success. A coil antenna need not be insulated from the earth to give good results. Two vertical pipes grounded at each end and having a connection made across their upper ends have been successfully used for this purpose, and several years ago two members of the Bureau's staff developed a coil antenna for use on submarines consisting of a single wire elevated a short distance above the submarine connected at each end to the metallic hull of the vessel. This constituted a single turn coil antenna of which the hull formed a part, and successful communication has been carried on with a submarine so equipped.

A similar arrangement was adopted on the motor lifeboat for the Coast Guard. The boat on which the installation was made was 36 ft. long, driven by a gasoline engine, and was equipped with a heavy metal keel. The receiving and transmitting set was installed on the boat as far forward as possible and from it a wire was run forward connected to the keel, two other wires heavily insulated were run aft along the guards and connected to the keel. A particular kind of coil antenna was thus formed of which the keel formed a part.

This arrangement was satisfactory from a navigating point of view. The transmitting apparatus used at the station and on the boat were identical and consisted of a 5-watt radio telephone receiving set. The wave length used for transmission from the boat was

380 meters and that used for transmission from the shore station was 675 meters, the receiving equipment used included an amplifier employing 3 stages of radio frequency amplification and 2 stages of audio frequency amplification and was specially designed for the wave length used. This apparatus as installed on the boat was extremely compact.

On November 15, a demonstration was made at Atlantic City before representatives of the Coast Guard, and when the boat was 6 miles from shore good communication was maintained with the shore station. This distance is sufficient for the ordinary needs of the work, but if a greater distance is to be covered, it will, of course, be possible to use a transmitting set more powerful than the 5-watt set used in these tests.

The results of the tests were regarded as highly satisfactory, and consideration is being given by the Coast Guard to the installation of radio telephone equipment at a number of the more important stations.

18 Improvement in Quality of Rare Metal Thermocouples

Tests made by the pyrometry laboratory of the Bureau early in 1921 revealed the fact that many of the platinum-rhodium thermocouples found on the American market were subject to large changes in indication after long continued exposure to very high temperatures. The constancy and reliability of these couples is a matter of great importance in view of their widespread industrial application for the measurement and control of high temperatures, and because upon correct functioning of these thermocouples depends the quality and physical properties of many manufactured products.

The wires from which these thermocouples were made were obtained from two sources, one American and one British. The tests showed that the former were of satisfactory purity for the use to which such couples are applied. They satisfactorily met all industrial requirements as to constancy and reliability if properly protected by well-known methods of insulation.

The British refined metals and alloys were found to be subject to large changes in their indications because of exposure to high temperatures. Chemical and spectroscopic tests revealed the fact that the trouble was due to the presence of several tenths of a percent of iron in the platinum-rhodium alloy wire. The platinum wires, on the other hand, were found to be of high and satisfactory degree of purity.

The facts developed by these tests were immediately communicated to the firms engaged in refining the metals used for thermocouples as well as to manufacturers of pyrometers who were employing them in their pyrometric installations. As a result of these tests, the British

firm determined to improve its product and immediately took up the problem of producing new platinum-rhodium alloys free from the presence of iron or other impurities. Samples of their improved wire were submitted to the Bureau for test a few months ago, and the results show the new couples to be eminently satisfactory. Therefore, at the present time purchasers have a choice of two makes of wire either of which will prove to be satisfactory.

Full details of the life tests of all the thermocouples included in this investigation, as well as the chemical and spectroscopic tests made on the wires entering into their construction, have been submitted for publication in Chemical and Metallurgical Engineering. This work has resulted in a marked advance in reliability of high temperature measurements since it has brought about the general use of materials of sufficiently high purity to remove an important cause of variations in thermocouple indications.

Respectfully,

S. W. STRATTON

Director

HGB